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Bharadwaj

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(54) **SYSTEMS AND METHODS FOR BROADCASTING AND MULTICASTING SHORT MESSAGE SERVICE MESSAGES**

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H04W 4/00 (2009.01)

(52) **U.S. Cl.** **455/466**; 370/335; 370/312; 370/390; 709/227; 455/458; 455/435.1; 455/518; 455/515

(58) **Field of Classification Search** 455/411–466; 370/390, 328, 335
See application file for complete search history.

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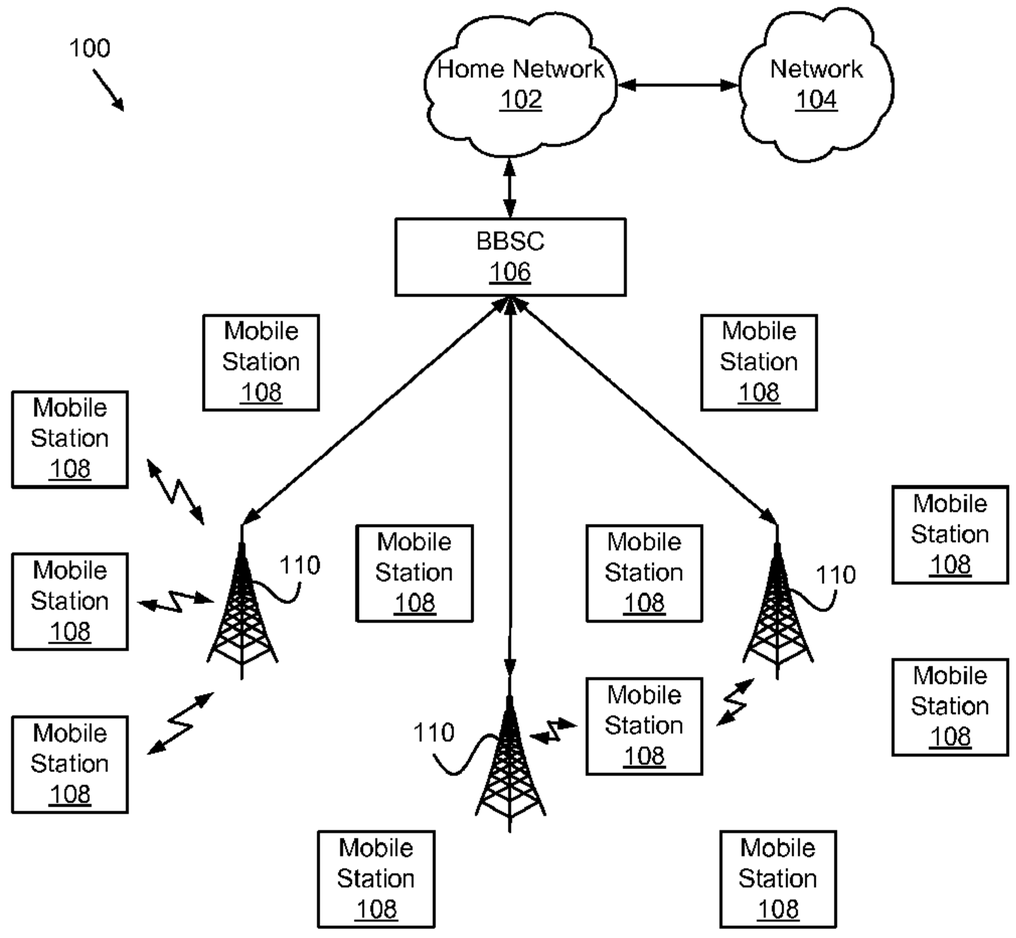
(74) *Attorney, Agent, or Firm* — Darren M. Simon

(57) **ABSTRACT**

A method for broadcasting a short message service (SMS) payload is disclosed. The SMS payload is sent to a home network. The SMS payload is encapsulated in a session initiation protocol (SIP) message. The SIP message is sent to a target user equipment (UE). A SIP response is received from the target UE. The SMS payload is extracted from the SIP message. The SMS payload is broadcasted to a plurality of mobile stations.

13 Claims, 14 Drawing Sheets



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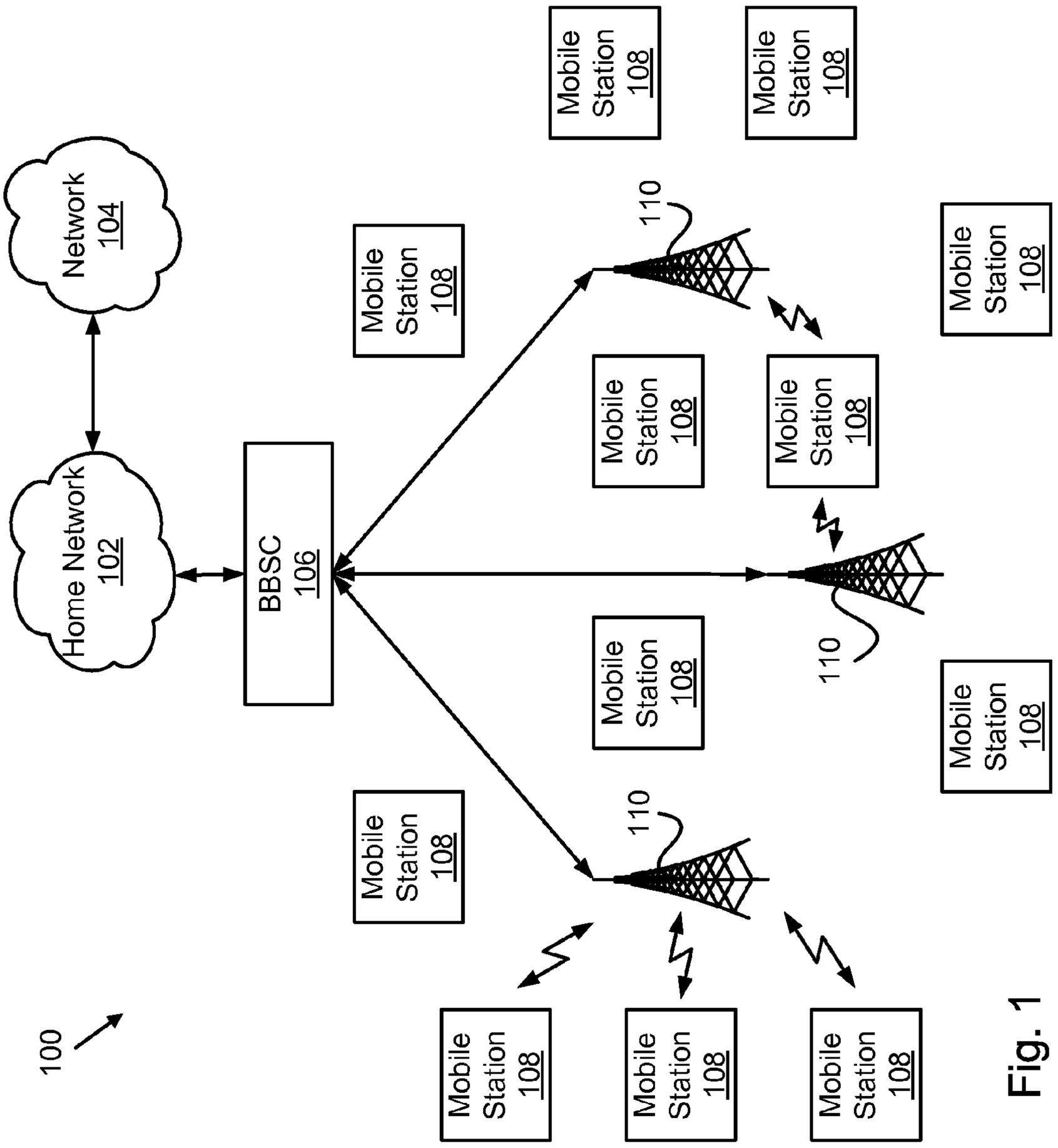

100
Home Network 102
Network 104
BBSC 106
Mobile Station 108
110

Fig. 1

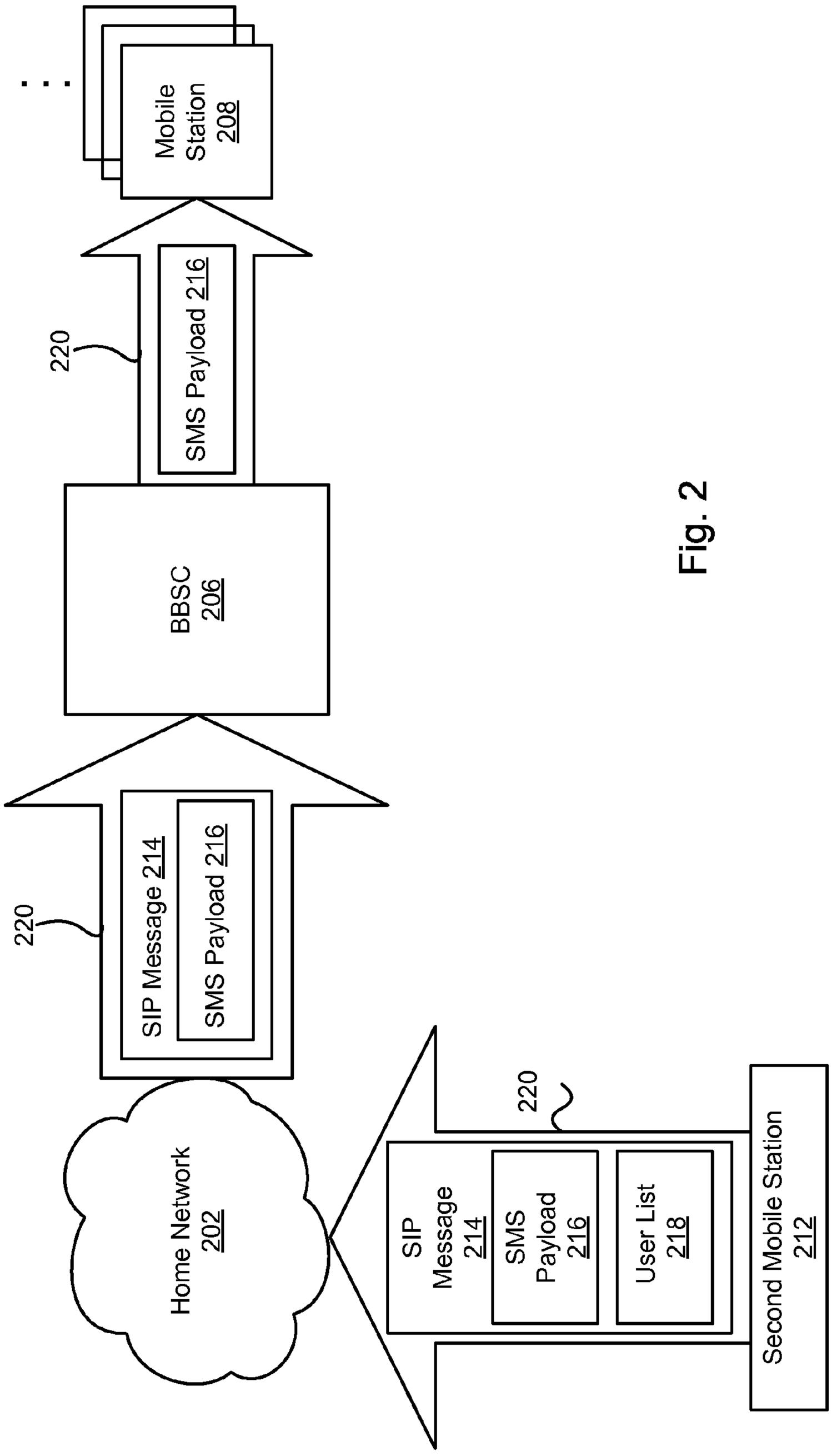

Mobile Station 208
SMS Payload 216
220
BBSC 206
SIP Message 214
SMS Payload 216
220
Home Network 202
SIP Message 214
SMS Payload 216
User List 218
220
Second Mobile Station 212

Fig. 2

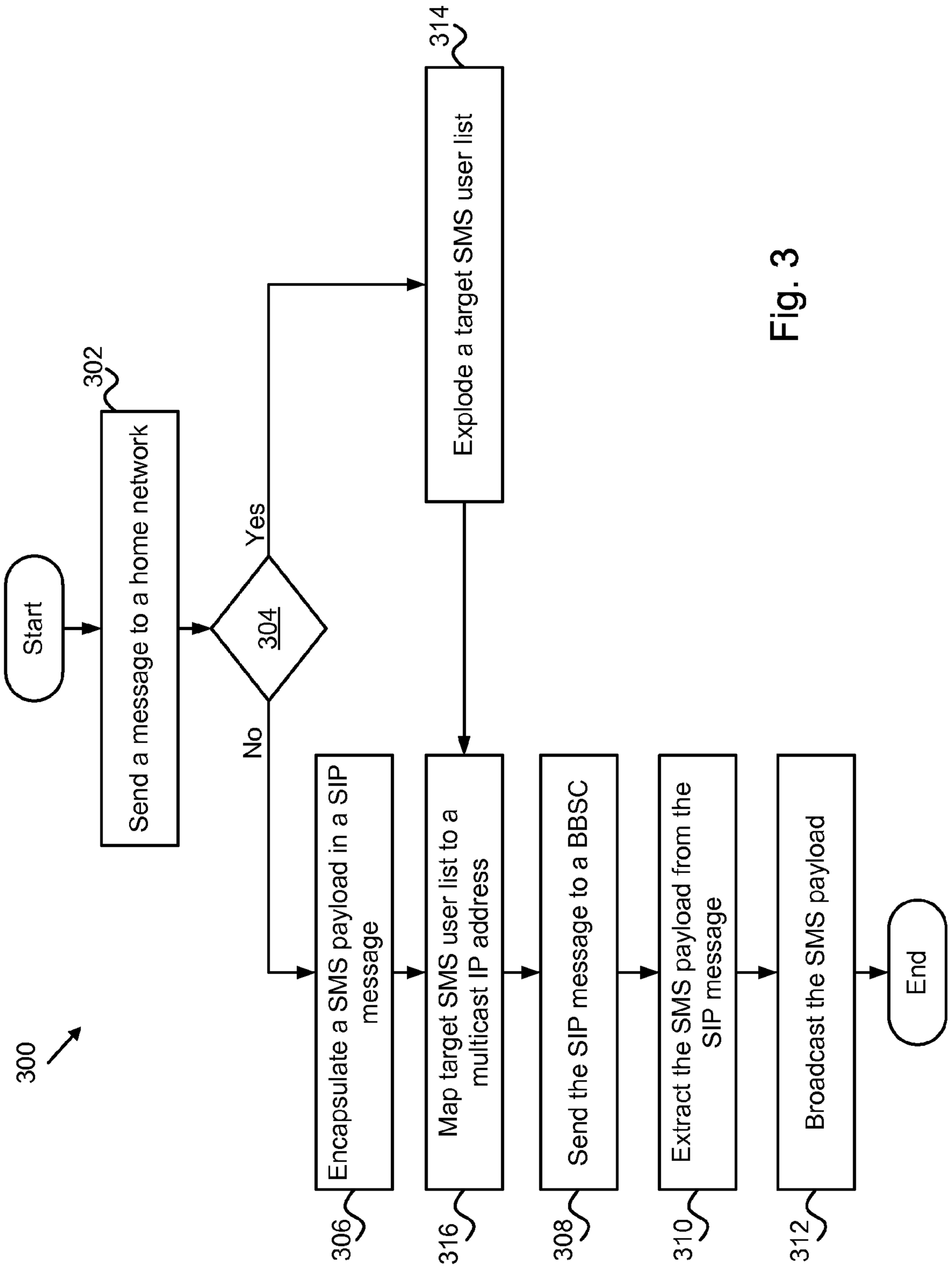

300
Start
302
Send a message to a home network
304
Yes
No
314
Explode a target SMS user list
306
Encapsulate a SMS payload in a SIP message
316
Map target SMS user list to a multicast IP address
308
Send the SIP message to a BBSC
310
Extract the SMS payload from the SIP message
312
Broadcast the SMS payload
End

Fig. 3

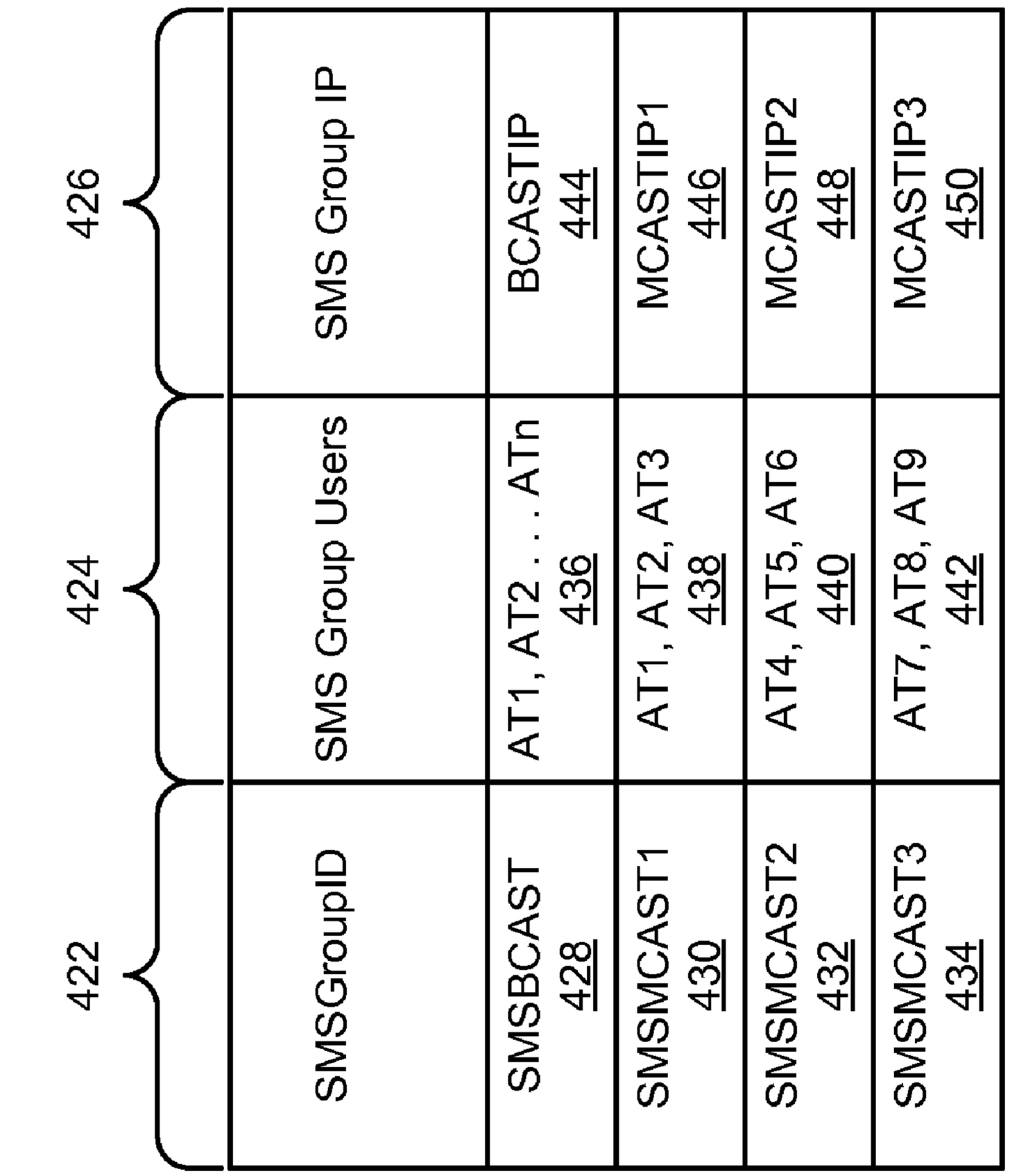

400
422
424
426
SMSGroupID
SMS Group Users
SMS Group IP
SMSBCAST 428
SMSMCAST1 430
SMSMCAST2 432
SMSMCAST3 434
AT1, AT2 . . . ATn 436
AT1, AT2, AT3 438
AT4, AT5, AT6 440
AT7, AT8, AT9 442
BCASTIP 444
MCASTIP1 446
MCASTIP2 448
MCASTIP3 450

Fig. 4

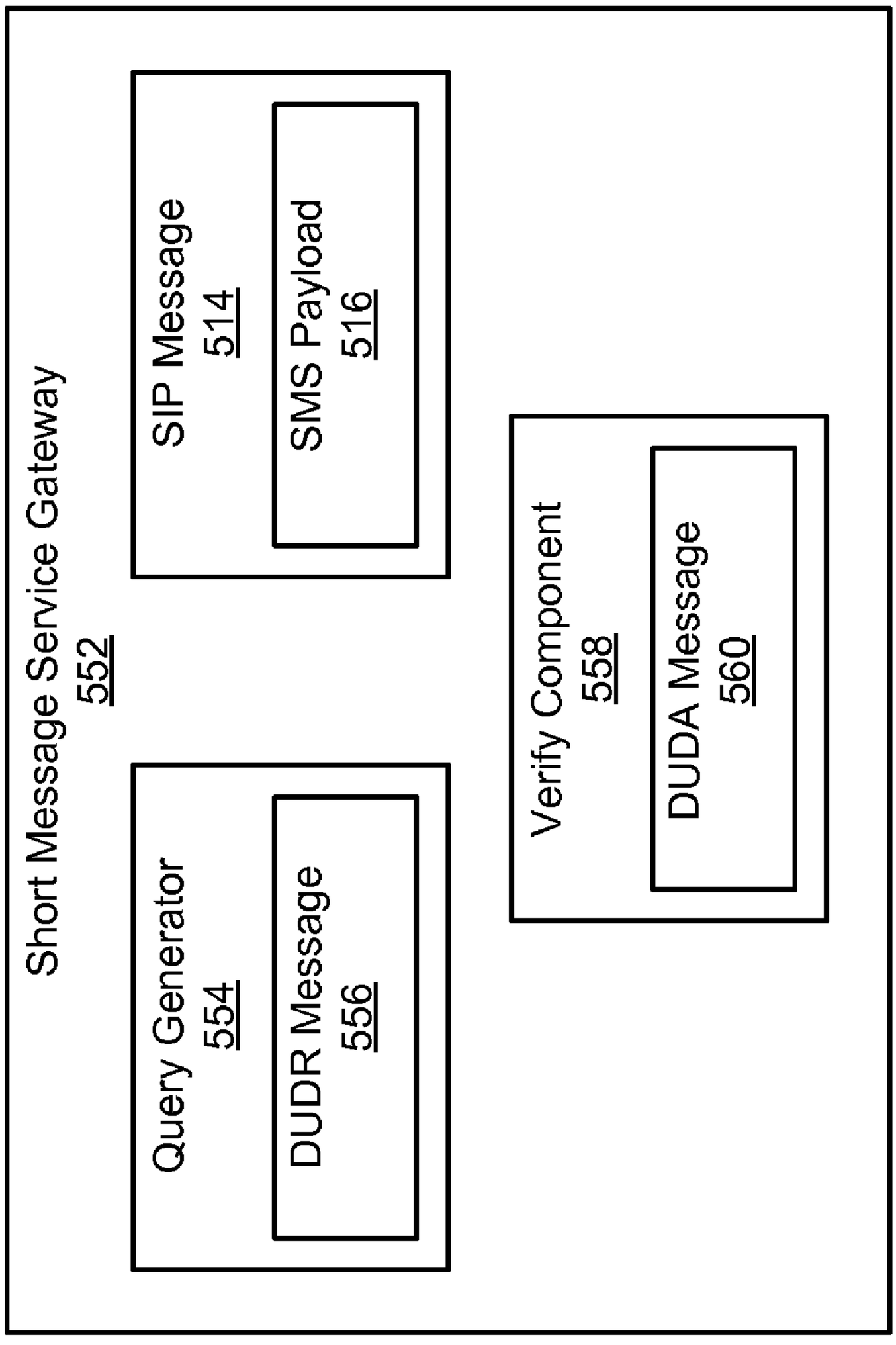

Short Message Service Gateway
552
SIP Message
514
SMS Payload
516
Query Generator
554
DUDR Message
556
Verify Component
558
DUDA Message
560

Fig. 5

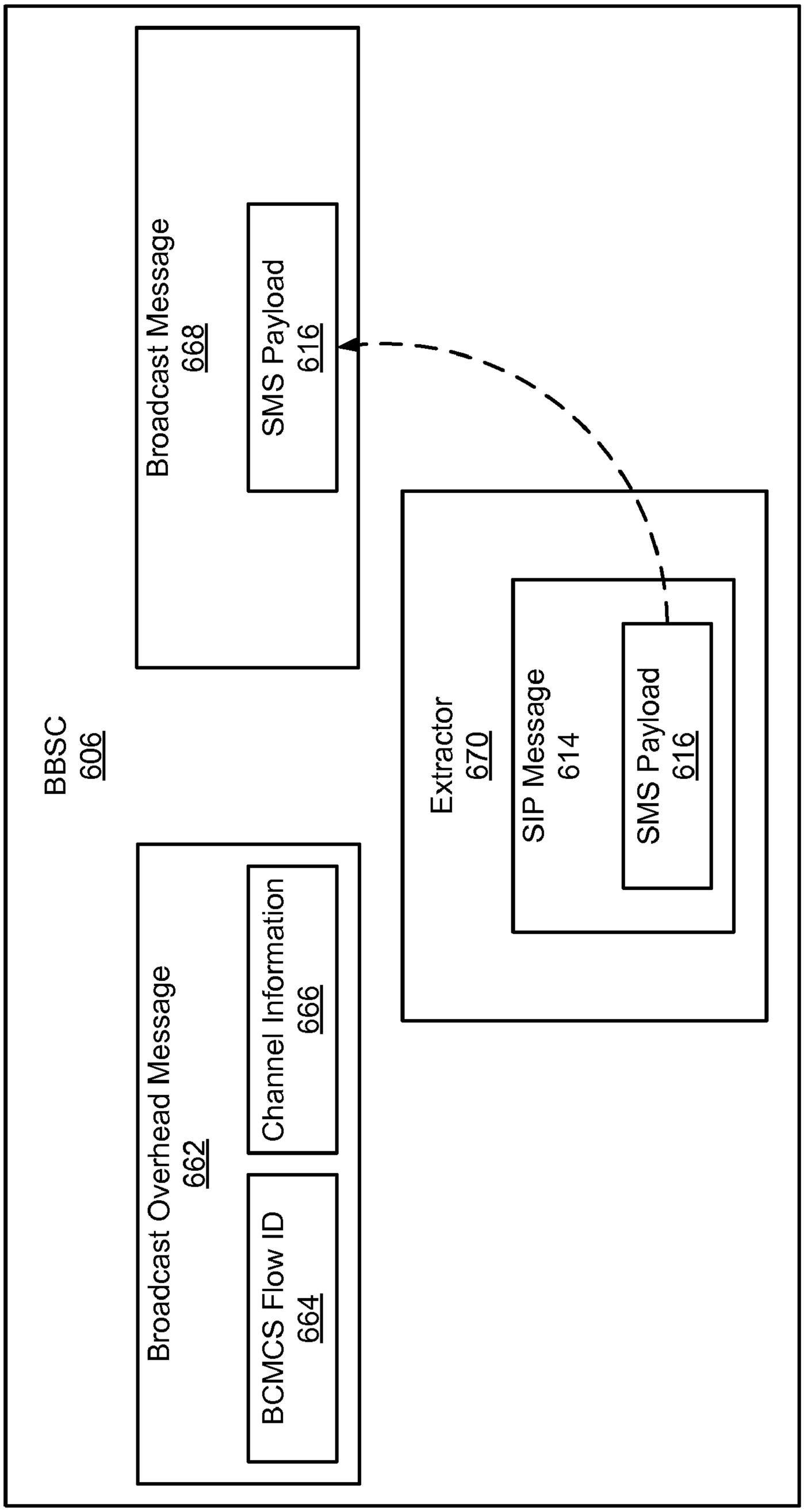

BBSC
606
Broadcast Message
668
SMS Payload
616
Extractor
670
SIP Message
614
SMS Payload
616
Broadcast Overhead Message
662
BCMCS Flow ID
664
Channel Information
666

Fig. 6

Fig. 7

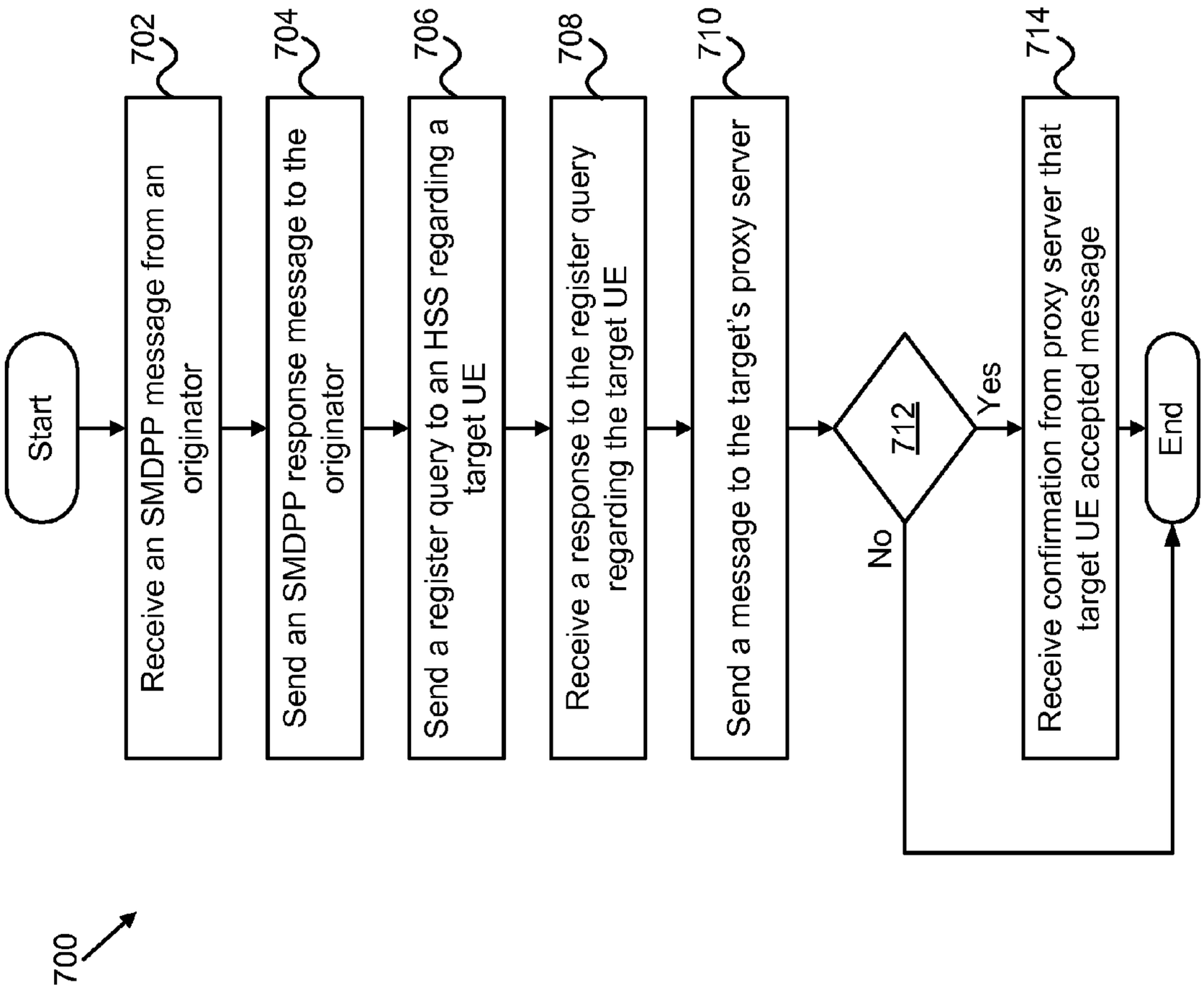
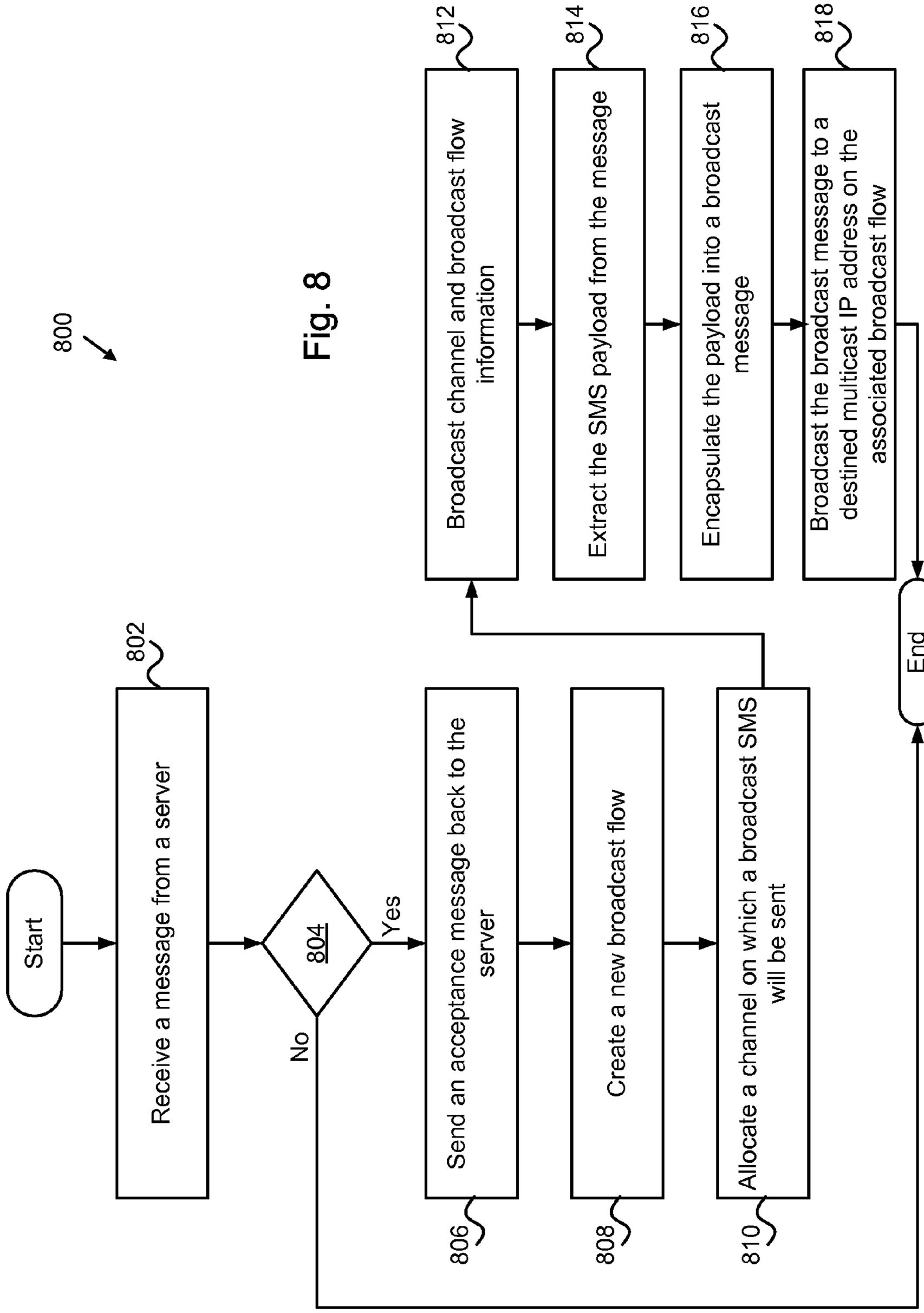

Start
Receive an SMDPP message from an originator
Send an SMDPP response message to the originator
Send a register query to an HSS regarding a target UE
Receive a response to the register query regarding the target UE
Send a message to the target's proxy server
712
No
Yes
Receive confirmation from proxy server that target UE accepted message
End
700
702
704
706
708
710
714

Fig. 8


800
Start
802
Receive a message from a server
804
Yes
No
806
Send an acceptance message back to the server
808
Create a new broadcast flow
810
Allocate a channel on which a broadcast SMS will be sent
812
Broadcast channel and broadcast flow information
814
Extract the SMS payload from the message
816
Encapsulate the payload into a broadcast message
818
Broadcast the broadcast message to a destined multicast IP address on the associated broadcast flow
End

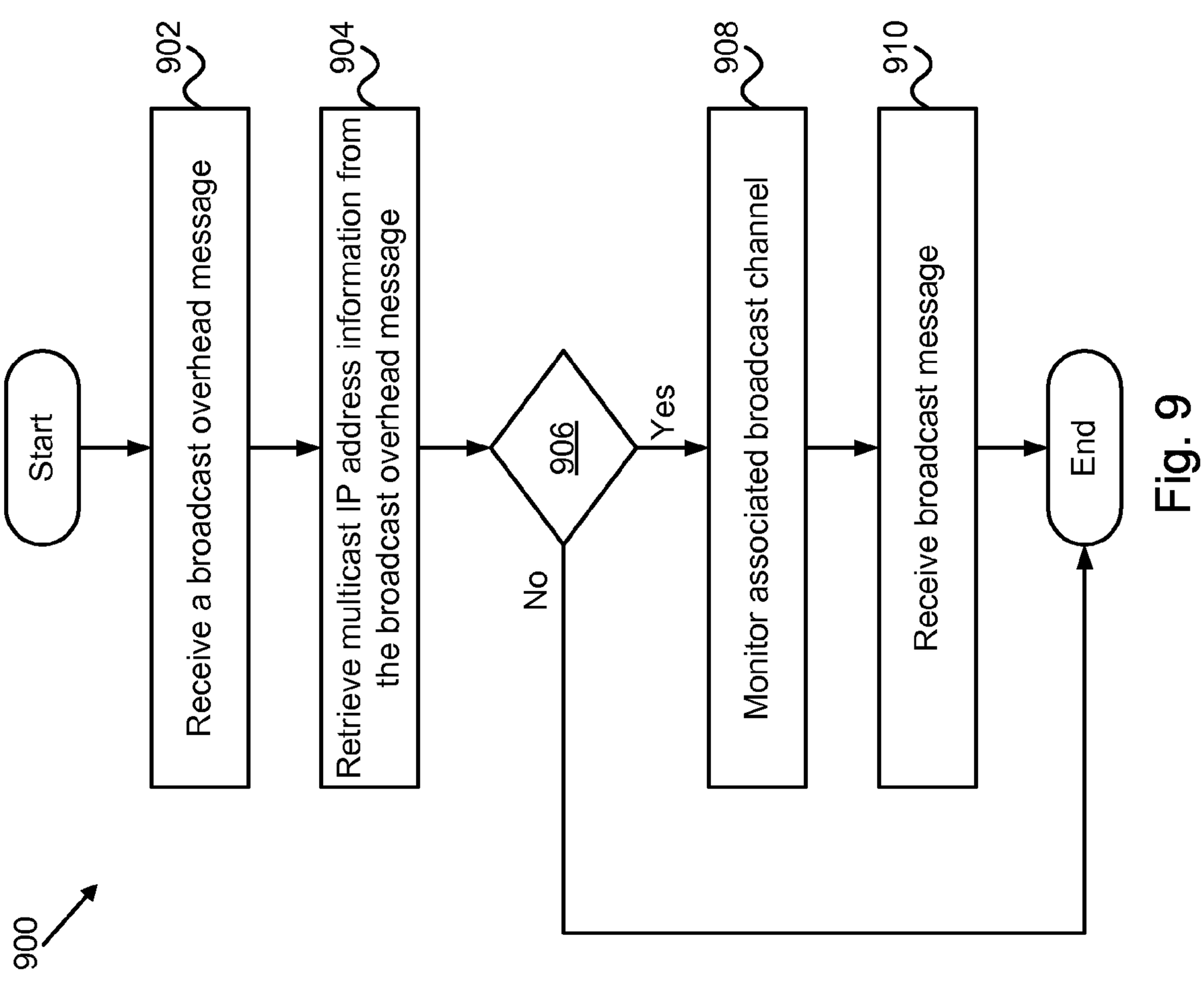

900
Start
902
Receive a broadcast overhead message
904
Retrieve multicast IP address information from the broadcast overhead message
906
Yes
No
908
Monitor associated broadcast channel
910
Receive broadcast message
End

Fig. 9

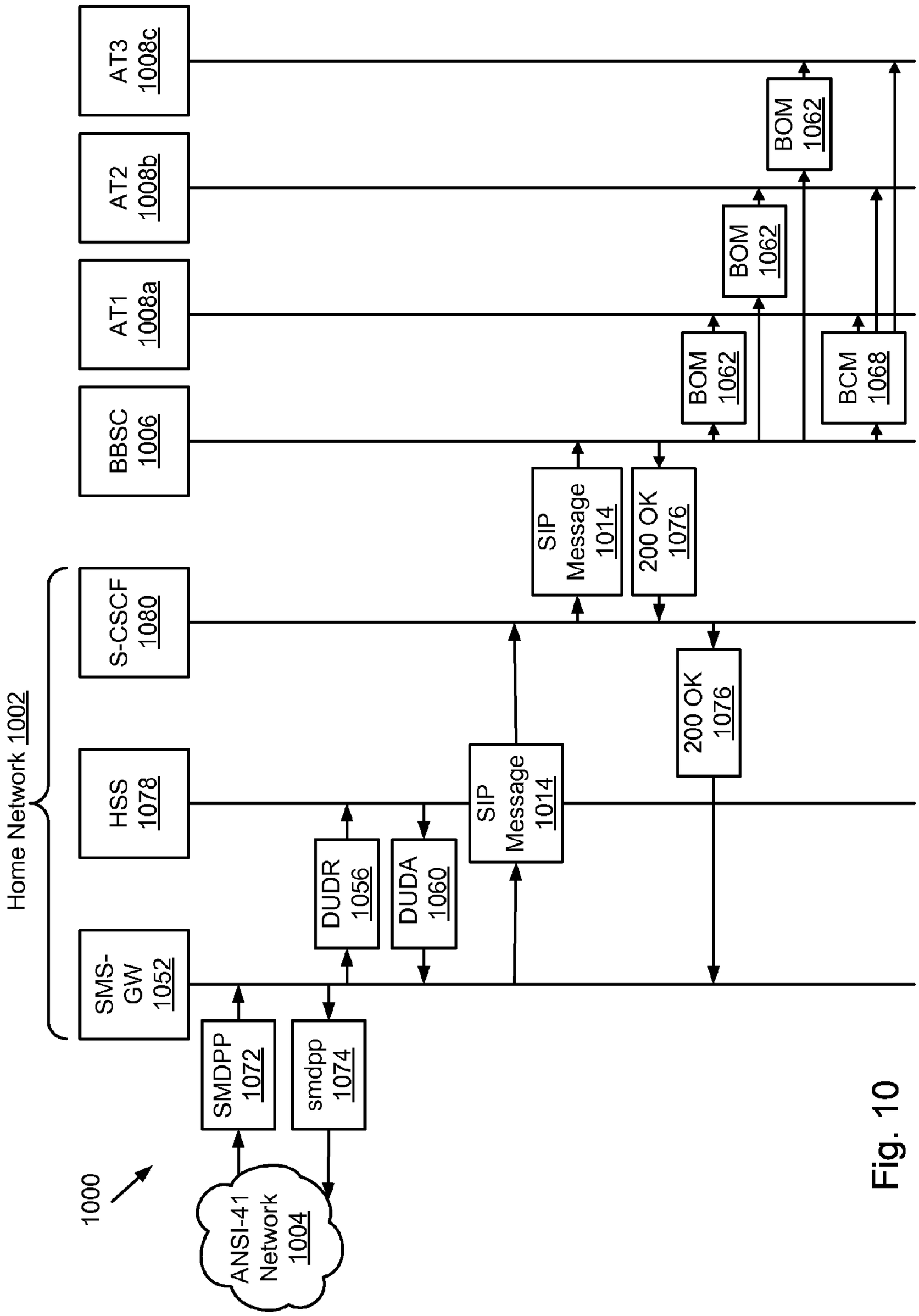

Home Network 1002
AT3 1008c
AT2 1008b
AT1 1008a
BBSC 1006
S-CSCF 1080
HSS 1078
SMS-GW 1052
SMDPP 1072
smdpp 1074
ANSI-41 Network 1004
1000
BOM 1062
BOM 1062
BOM 1062
BCM 1068
SIP Message 1014
200 OK 1076
DUDR 1056
DUDA 1060
SIP Message 1014
200 OK 1076

Fig. 10

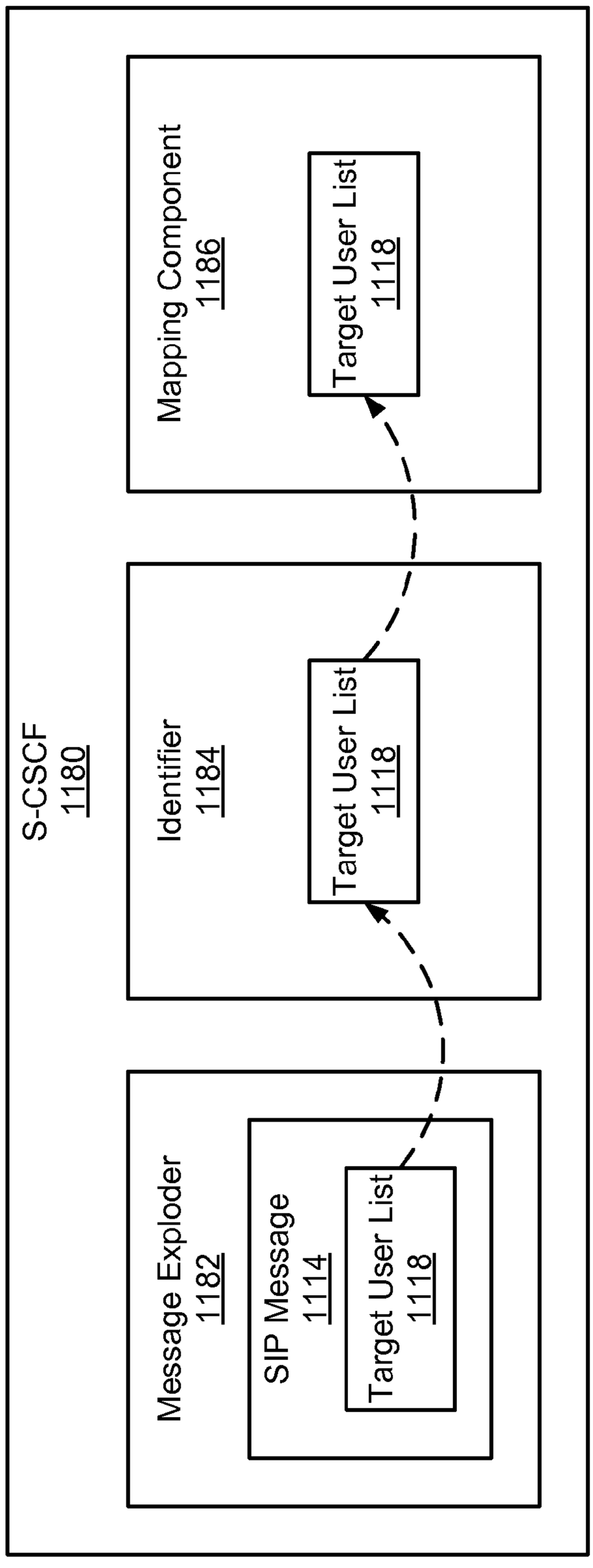

S-CSCF
1180
Mapping Component
1186
Target User List
1118
Identifier
1184
Target User List
1118
Message Exploder
1182
SIP Message
1114
Target User List
1118

Fig. 11

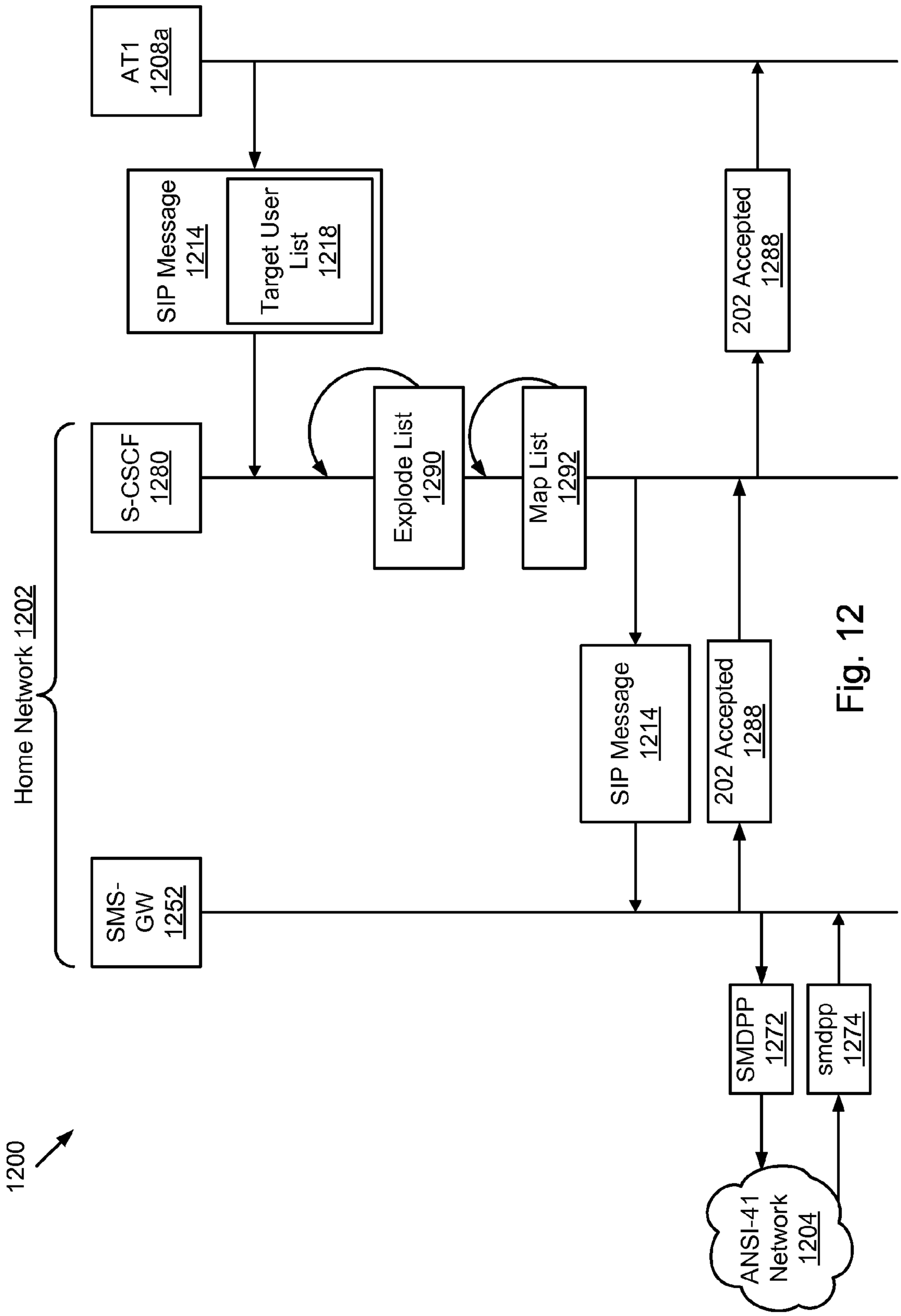

AT1
1208a
SIP Message
1214
Target User
List
1218
202 Accepted
1288
S-CSCF
1280
Explode List
1290
Map List
1292
SIP Message
1214
202 Accepted
1288
Home Network 1202
SMS-
GW
1252
SMDPP
1272
smdpp
1274
ANSI-41
Network
1204
1200

Fig. 12

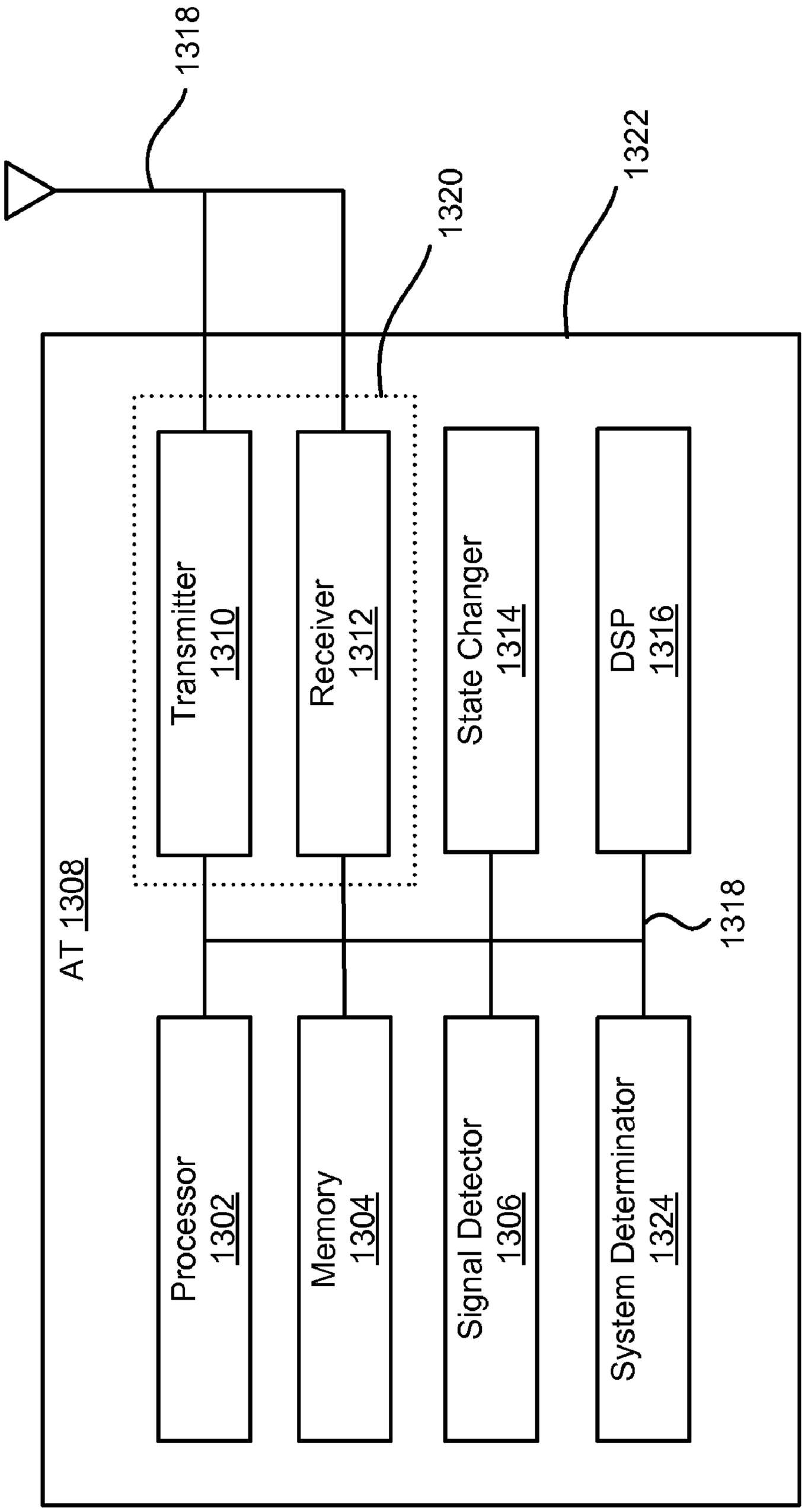

1318
1320
1322
AT 1308
Transmitter 1310
Receiver 1312
State Changer 1314
DSP 1316
1318
Processor 1302
Memory 1304
Signal Detector 1306
System Determinator 1324

FIG. 13

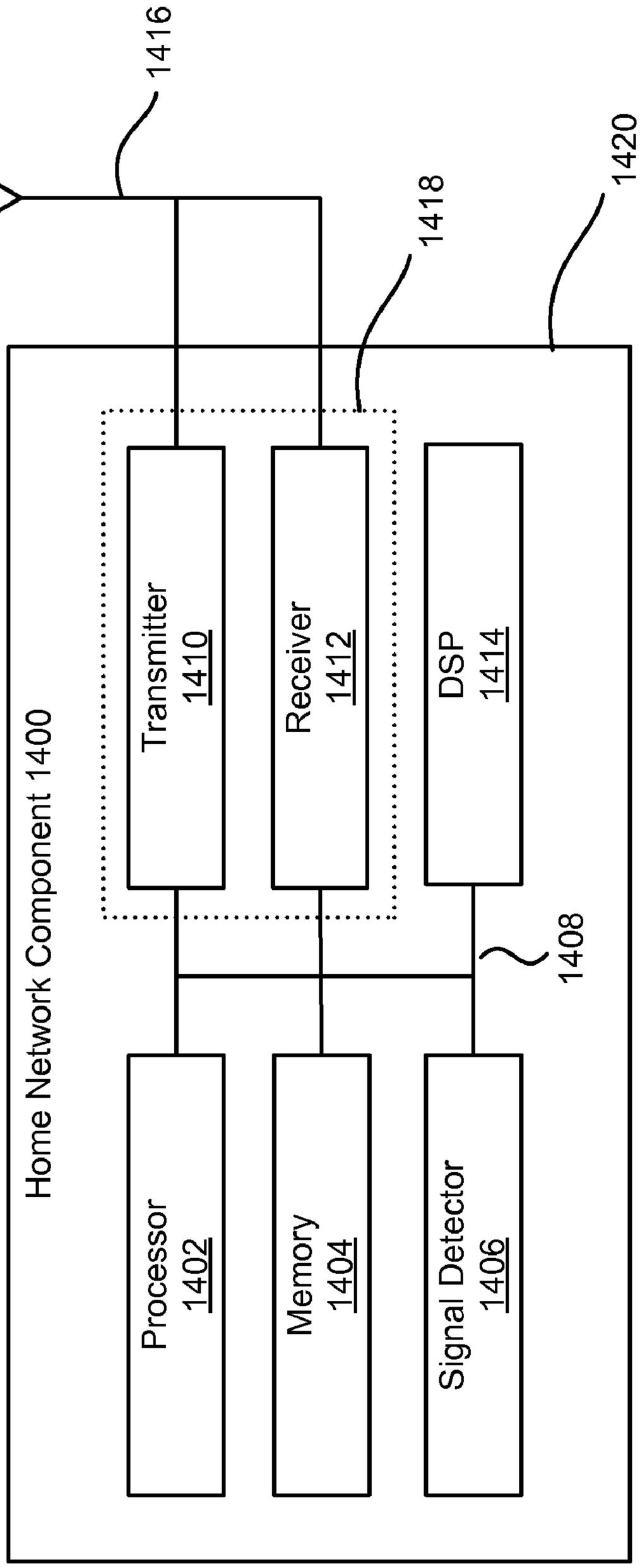

1416
1418
1420
Home Network Component 1400
Transmitter 1410
Receiver 1412
DSP 1414
1408
Processor 1402
Memory 1404
Signal Detector 1406

FIG. 14

SYSTEMS AND METHODS FOR BROADCASTING AND MULTICASTING SHORT MESSAGE SERVICE MESSAGES

CLAIM OF PRIORITY UNDER 35 U.S.C. §119

This present Application for Patent claims priority to Provisional Application No. 60/811,525 entitled "Broadcast/multicast SMS for CDMA 1× EVDO Networks" filed Jun. 6, 2006, and assigned to the assignee hereof and hereby expressly incorporated by reference herein.

TECHNICAL FIELD

The present systems and methods relate generally to communications. More specifically, the present systems and methods relate to broadcasting and multicasting short message service (SMS) messages.

BACKGROUND

In a wireless communication system, a broadcast short message service (SMS) allows the transmission of short messages from a subscription service to a mobile unit. Generally, broadcast SMS messages are messages associated with services subscribed to by a user. Broadcast SMS may comprise entry features, administration features, or information messages. For example, a subscriber may subscribe to a stock quotes service wherein the subscriber may receive stock quotes on a wireless device or a mobile unit, such as a personal data assistant (PDA), laptop computer, a cellular telephone or a portable communication system (PCS) telephone, from a subscription service utilizing the wireless communication system.

Various over-the-air interfaces have been developed for wireless communication systems including, e.g., frequency division multiple access (FDMA), time division multiple access (TDMA), and code division multiple access (CDMA). In connection therewith, various domestic and international standards have been established including, e.g., Advanced Mobile Phone Service (AMPS), Global System for Mobile Communication (GSM), and Interim Standard 95 (IS-95).

A wireless telephony communication system may include a code division multiple access (CDMA) system. The IS-95 standard and its derivatives, IS-95A, IS-95B, IS-2000, proposed high-data-rate CDMA standards optimized for data, etc. These standards are promulgated by a Telecommunication Industry Association (TIA) and other well known standard bodies to specify the use of a CDMA over-the-air interface for cellular or PCS telephony communication systems.

SUMMARY

The following presents a simplified summary of one or more aspects in order to provide a basic understanding of such aspects. This summary is not an extensive overview of all contemplated aspects, and is intended to neither identify key or critical elements of all aspects nor delineate the scope of any or all aspects. Its sole purpose is to present some concepts of one or more aspects in a simplified form as a prelude to the more detailed description that is presented later.

A method for broadcasting a SMS payload is disclosed. In one configuration, the SMS payload is sent to a home network. The SMS payload is encapsulated in a session initiation protocol (SIP) message. The SIP message is sent to a target user equipment (UE). A SIP response is received from the target UE. The SMS payload is extracted from the SIP message. The SMS payload is broadcast to a plurality of mobile stations.

A computer readable medium is also disclosed. The medium is configured to store a set of instructions executable to: receive a short message service (SMS) payload; encapsulate the SMS payload in a session initiation protocol (SIP) message; send the SIP message to a target user equipment (UE); and receive a SIP response from the target UE.

Another computer readable medium is also disclosed. The medium is configured to receive a session initiation protocol (SIP) message, send a SIP response to a home network, extract a short message service (SMS) payload from the SIP message, and broadcast the SMS payload to a plurality of mobile stations.

A method for receiving a short message service (SMS) payload is also disclosed. A broadcast overhead message is received. A multicast internet protocol (IP) address included within the broadcast overhead message is retrieved. A broadcast channel associated with the multicast IP address is determined to be monitored. The associated broadcast channel is monitored. A broadcast message including the SMS payload is received.

A system that is configured to broadcast a short message service (SMS) payload is also disclosed. The system includes a means for processing and a means for sending the SMS payload to a home network. A means for encapsulating the SMS payload in a session initiation protocol (SIP) message and a means for sending the SIP message to a target user equipment (UE) are disclosed. A means for receiving a SIP response from the target UE and a means for extracting the SMS payload from the SIP message are disclosed. A means for broadcasting the SMS payload to a plurality of mobile stations is disclosed.

Various configurations of the systems and methods are now described with reference to the Figures, where like reference numbers indicate identical or functionally similar elements. The features of the present systems and methods, as generally described and illustrated in the Figures herein, could be arranged and designed in a wide variety of different configurations. Thus, the detailed description below is not intended to limit the scope of the systems and methods, as claimed, but is merely representative of the configurations of the systems and methods.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates one configuration of a wireless communication system;

FIG. **2** illustrates one configuration of a home network sending information to a plurality of mobile stations;

FIG. **3** is a flow diagram illustrating a method to broadcast a short message service (SMS) message;

FIG. **4** is one configuration of a static table including pre-provisioned groups of mobile stations;

FIG. **5** is a block diagram illustrating one configuration of a short message service gateway (SMS-GW);

FIG. **6** is a block diagram illustrating one configuration of a broadcast base station controller (BBSC);

FIG. **7** is a flow diagram illustrating one configuration of a method to send a message to a target user equipment (UE);

FIG. **8** is a flow diagram illustrating one configuration of a method to broadcast a broadcast message;

FIG. **9** is a flow diagram illustrating one configuration of a method to receive the broadcast message;

FIG. **10** is a thread diagram illustrating one configuration of a method to send and receive SMS data;

FIG. **11** is a block diagram illustrating one configuration of a servicing call session control function (S-CSCF);

FIG. **12** is a thread diagram illustrating a further configuration of multicasting SMS data;

FIG. **13** illustrates various components that may be utilized in an access terminal in accordance with a configuration; and

FIG. **14** is a functional block diagram illustrating one configuration of a home network component.

DETAILED DESCRIPTION

Broadcasting and multicasting short message service (SMS) messages utilize over-the-air resources of the systems or networks that transmit the SMS messages. SMS messages may also be unicasted. The increase in the over-the-air resources used to unicast the messages may cause an inefficient use of the network capacity because a traffic channel for each recipient of the SMS message is established. This inefficiency may be overcome when a single broadcast/multicast channel is used to send the same SMS message to the recipients. As such, benefits may be realized by improved systems and methods for broadcasting and multicasting SMS messages using a code division multiple access 1× evolution data optimized (CDMA 1× EV-DO) network.

Many features of the configurations disclosed herein may be implemented as computer software, electronic hardware, or combinations of both. To clearly illustrate this interchangeability of hardware and software, various components will be described generally in terms of their functionality. Whether such functionality is implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system. Skilled artisans may implement the described functionality in varying ways for each particular application, but such implementation decisions should not be interpreted as causing a departure from the scope of the present systems and methods.

Where the described functionality is implemented as computer software, such software may include any type of computer instruction or computer executable code located within a memory device and/or transmitted as electronic signals over a system bus or network. Software that implements the functionality associated with components described herein may comprise a single instruction, or many instructions, and may be distributed over several different code segments, among different programs, and across several memory devices.

As used herein, the terms "a configuration," "configuration," "configurations," "the configuration," "the configurations," "one or more configurations," "some configurations," "certain configurations," "one configuration," "another configuration" and the like mean "one or more (but not necessarily all) configurations of the disclosed systems and methods," unless expressly specified otherwise.

The term "determining" (and grammatical variants thereof) is used in an extremely broad sense. The term "determining" encompasses a wide variety of actions and therefore "determining" can include calculating, computing, processing, deriving, investigating, looking up (e.g., looking up in a table, a database or another data structure), ascertaining and the like. Also, "determining" can include receiving (e.g., receiving information), accessing (e.g., accessing data in a memory) and the like. Also, "determining" can include resolving, selecting, choosing, establishing, and the like.

The phrase "based on" does not mean "based only on," unless expressly specified otherwise. In other words, the phrase "based on" describes both "based only on" and "based at least on."

Short message service (SMS) messages may be broadcasted on 1× Evolution Data Optimized (EV-DO) networks by using supported EV-DO Broadcast-Multicast Services (BCMCS). Using supported EV-DO BCMCS to broadcast SMS messages may reduce over-the-air resources used by networks to broadcast SMS messages to mobile terminals, thereby providing carriers with a more efficient use of their network capacity. An efficient use of forward link capacity provided by the EV-DO BCMCS framework may be utilized.

SMS broadcast services may be used for broadcasting network information such as alerts to users in a sector, while multicast services may be restricted to pre-provisioned user groups. The EV-DO BCMCS framework may also utilize session initiation protocol (SIP) messages to encapsulate SMS messages that are communicated between Internet protocol multimedia subsystem (IMS) network entities and a broadcast network element (for example a broadcast base station controller (BBSC)) that interfaces with a EV-DO radio access network (RAN) and then utilize the BCMCS service provided by the broadcast network element to broadcast SMS data to mobile stations. SMS data may also be multicasted between pre-defined and pre-configured user groups.

Using the BCMCS framework to use a single broadcast channel to broadcast SMS data instead of setting up separate traffic channels to each mobile station interested in receiving the SMS data reduces network resource capacity usage. A significant reduction in resource usage may result in a capacity gain for the network.

FIG. **1** illustrates one configuration of a wireless communication system **100**. In one aspect, the system **100** is a code division multiple access (CDMA) wireless communication system. In further configurations, the system **100** may utilize other transmission modulation schemes such as time division multiple access (TDMA) and frequency division multiple access (FDMA) as well as other spread spectrum systems.

As illustrated in FIG. **1**, the system **100** may include a plurality of mobile stations **108**, a plurality of base stations **110**, a broadcast base station controller (BBSC) **106**, and a home network **102**. In one configuration, the home network **102** may be configured to interface with a network **104**. In one configuration, the network **104** may include an ANSI-41 network. The home network **102** may also be configured to interface with the BBSC **106**.

The BBSC **106** may be coupled to each of the base stations **110** via backhaul lines. The backhaul lines may support any one of several interfaces, including, e.g., E1/T1, asynchronous transfer mode (ATM), Internet protocol (IP), point-to-point protocol (PPP), Frame Relay, high data rate digital subscriber line (HDSL), asymmetric digital subscriber line (ADSL), or digital subscriber line (xDSL). In one configuration, the system **100** may include more than one BBSC **106**.

In one aspect, each base station **110** may include at least one sector (not shown). Each sector may include an omnidirectional antenna or an antenna pointed in a particular direction radially away from the base station **110**. Alternatively, each sector may include two antennas for diversity reception. Each base station **110** may advantageously be designed to support a plurality of frequency assignments. The intersection of a sector and a frequency assignment may be referred to as a CDMA channel. The base station **110** may also be known as base station transceiver subsystems (BTSs) **110**. Alternatively, "base station" may be used in the industry to refer collectively to a BSC **110** and one or more BTSs **110**. The BTSs **110** may also be denoted as "cell sites." Alternatively, individual sectors of a given BTS **110** may be referred to as cell sites. The mobile stations **108** may be typically cellular or

personal communications service (PCS) telephones. The system **100** may be advantageously configured for use in accordance with an IS-95 standard.

During operation of the cellular telephone system, the base stations **110** may receive sets of reverse link signals from sets of mobile stations **108**. The mobile stations **108** may be conducting telephone calls or other communications. Each reverse link signal received by a given base station **110** may be processed within that base station **110**. The resulting data may be forwarded to the BBSC **106**. The BBSC **106** may provide call resource allocation and mobility management functionality including the orchestration of soft handoffs between base stations **110**. The BBSC **106** may also route the received data to the home network **102**, which may provide additional routing services for interface with the network **104**. Similarly, the network **104** may interface with the home network **102**, and the home network **102** may interface with the BBSC **106**, which in turn may control the base stations **110** to transmit sets of forward link signals to sets of the mobile stations **108**.

FIG. **2** illustrates one configuration of the home network **202** sending information to a plurality of mobile stations **208**. In one configuration, the home network **202** transmits a short message service (SMS) payload **216** to the plurality of mobile stations **208**. The SMS is a service available on devices such as the mobile stations **208**. The SMS service may also be available on other handheld devices, landline telephones, and the like. The SMS permits the sending of text messages between mobile stations **208**. The SMS payload **216** may be encapsulated within a session initiation protocol (SIP) message **214**. The SIP message **214** may be an application-layer control protocol for creating, modifying, and terminating sessions with one or more participants. These sessions may include Internet telephone calls, multimedia distribution, and multimedia conferences. In one configuration, the home network **202** may receive the SIP message **214** from another device (not shown) over an ANSI-41 network. The SIP message **214** may be transmitted from the home network **202** to the BBSC **206** over a carrier's backhaul network **220** which may connect the BBSC **206** with the remainder of core network entities. The BBSC **206** may extract the SMS payload **216** from the SIP message **214** and transmit the SMS payload **216** to the plurality of mobile stations **208** using CDMA 1× EVDO BCMCS. In one configuration, the BBSC **206** transmits the SMS payload **206** over the carrier's backhaul network **220**.

In a further configuration, the home network **202** may receive the SIP message **214** from a second mobile station **212**. The SIP message **214** may include a target SMS user list **218** in addition to the SMS payload **216**. The target SMS user list **218** may specify a specific plurality of mobile stations **208** that should receive the SMS payload **216**.

FIG. **3** is one configuration of a flow diagram illustrating a method **300** to broadcast the SMS payload **216**. In one configuration, a message is sent **302** to the home network **102**. If the message is not **304** a SIP message **214**, the SMS payload **216** may be encapsulated **306** within a SIP message **214**. In one configuration, the SIP message **214** may include the target SMS user list **218** and the SMS payload **216**. The target SMS user list **218** may be mapped **316** to a multicast IP address. The SIP message **214** may be sent **308** to the BBSC **106**, and the SMS payload **216** may be extracted **310** from the SIP message **214**. The SMS payload **216** may then be broadcasted **312**. In one configuration, the SMS payload **216** may be broadcast **312** to the plurality of mobile stations **208**.

Alternatively, the home network **102** may determine **304** that the message is a SIP message **214**. In one configuration, the SIP message **214** may include the target SMS user list **218** and the SMS payload **216**. In one configuration, the SIP message **214** is received and the target SMS user list **218** is exploded **314** from the SIP message **214**. The target SMS user list **218** may be mapped **316** to a multicast IP address. The SIP message **214** may be sent **308** to the BBSC **106** and the SMS payload **216** may be extracted **310** from the SIP message **214**. The SMS payload **216** may be broadcasted **312**. In one configuration, the SMS payload **312** may be broadcast **312** to the multicast IP address mapped **316** to the target SMS user list **218**.

FIG. **4** illustrates one configuration of a static table **400** which may include pre-provisioned groups of mobile stations **208**. In the depicted Figure, the groups of mobile stations **208** may be associated with an SMS group users category **424**. The table **400** may also include an SMSGroupID category **422** and an SMS Group IP category **426**. In one configuration, the mobile stations **208** may be classified in various user groups within the static table **400**.

The SMS group users category **424** may include pre-provisioned groups of mobile stations **208**. In one configuration, mobile stations **208** may be referred to as access terminals (AT). A first AT group **436** of access terminals included in the SMS group users category **424** may include each AT included in a network system. For example, the first AT group **436** may include AT**1**, AT**2**, . . . ATn, where there are "n" access terminals in the network system. A second AT group **438** may include a subset of access terminals, such as AT**1**, AT**2** and AT**3**. A third AT group **440** may also include a subset of access terminals, such as AT**4**, AT**5** and AT**6**. Similarly, a fourth AT group **442** may include a subset of access terminals, for example, AT**7**, AT**8** and AT**9**.

The SMSGroupID category **422** may include an identification corresponding to a particular AT group. For example, a first identification SMSBCAST **428** may correspond to the first AT group **436**. A second identification SMSMCAST1 **430** may be associated with the second AT group **438**. A third identification SMSMCAST2 **432** may correspond to the third AT group **440**. Similarly, a fourth identification SMSMCAST3 **434** may be associated with the fourth AT group **442**.

The SMS Group IP category **426** may include an IP address associated with each SMS group within the SMS group users category **424**. In one configuration, the IP address may include a broadcast IP address which may facilitate each AT in the system to receive a SMS payload **216**. In a further configuration, the IP address may include a multicast IP address which facilitates a subset of the ATs to receive the SMS payload **216**. A first address BCASTIP **444** may correspond to the first AT group **436**. A second address MCASTIP1 **446** may be associated with the second AT group **438**. Further, a third address MCASTIP2 **448** may correspond to the third AT group **440**. Similarly, a fourth address MCASTIP3 **450** may be associated with the fourth AT group **442**.

FIG. **5** is a bock diagram illustrating one configuration of a short message service gateway (SMS-GW) **552**. The SMS-GW **552** may be implemented in the home network **102** and may facilitate receiving an SMS payload **516** and transmitting the SMS payload **516** to the BBSC **106**. The SMS-GW **552** may include a query generator **554**. The generator **554** may generate a query regarding the status of the BBSC **106**. In one configuration, the query generator **554** may generate a diameter user-data-request (DUDR) message **556**. The DUDR message **556** may allow the SMS-GW **552** to query whether or not the BBSC **106** is registered on a particular subsystem. The SMS-GW **552** may also include a verify component **558** which verifies if the BBSC **106** is registered on the particular subsystem. The verify component **558** may include a diam-

eter user-data-answer (DUDA) message **560** which may indicate if the BBSC **106** is registered. The SMS-GW **552** may further include the SMS payload **516**. In one configuration, the SMS payload **516** may be encapsulated in a SIP message **514**.

FIG. **6** is a block diagram illustrating one configuration of the BBSC **606**. The BBSC **606** may receive an SMS payload **616** and broadcast the SMS payload **616**. The BBSC **606** may include a broadcast overhead message (BOM) **662**. The BOM **662** may include broadcast multicast services flow identification (BCMCS Flow ID) **664**. The BCMCS Flow ID **664** may include information regarding the IP address to which the SMS payload **616** is broadcasted. In one configuration, the BCMCS Flow ID **664** may be associated with a multicast IP address to which the SMS payload **616** may be sent. The BOM **662** may also include channel information **666** which may be information pertaining to the broadcast channel on which the BBSC **606** broadcasts the SMS payload **616**.

The BBSC **606** may also include an extractor **670** which serves to extract the SMS payload **616** which is encapsulated within an SIP message **614**. The extracted SMS payload **616** may then be included in a broadcast message **668**. The BBSC **606** may broadcast the broadcast message **668** with the SMS payload **616** to a plurality of access terminals. In a further configuration, the BBSC **606** may multicast the broadcast message **668** with the SMS payload **616** to a pre-provisioned group of access terminals.

FIG. **7** is a flow diagram illustrating one configuration of a method **700** to send a message to target user equipment (UE). In one configuration, the message may include the SMS payload **216**. The method **700** may be implemented by the SMS-Gateway (GW) **552**. As previously explained, the SMS-GW **552** may be implemented in the home network **102** and the SMS-GW may facilitate receiving the SMS payload **216** and transmitting the SMS payload **216** to the BBSC **106**.

The SMS-GW **552** may receive **702** a short message service delivery point to point (SMDPP) message from an originator. In one configuration, the originator may be a second SMS-GW. The SMS-GW **552** may send **704** a SMDPP response to the originator to indicate that the SMDPP message was received. The SMS-GW **552** may send **706** a register query to a home subscriber service (HSS) regarding the target UE. In one configuration, the target UE may include the BBSC **106**. The register query may be generated by the query generator **554** and may include a DUDR **556** as to whether or not the target UE is registered on an IP Multimedia Subsystem (IMS). The IMS may include a next generation networking (NGN) architecture that facilitates providing mobile and fixed multimedia services.

The SMS-GW **552** may receive **708** a response to the register query regarding the target UE indicating that the target UE is registered on the IMS. The response may include a DUDA **560** as previously described. The SMS payload **216** may be sent **710** to a proxy server of the target UE. In one configuration, the SMS payload **216** may be sent **710** encapsulated in a SIP message **214** and using SIP messaging technology. If the SIP message **214** is not **712** accepted by the target UE, the method **700** ends. If the target UE does **712** accept the SIP message **214**, the SMS-GW **552** may receive **714** a confirmation from the proxy server that the target UE accepted the SIP message **214**.

FIG. **8** is a flow diagram illustrating one configuration of a method **800** to broadcast the broadcast message **668** which may include SMS payload **216**. In one configuration, the method **800** may be implemented by the BBSC **106**. The BBSC **106** may receive **802** a message from a server. In one configuration, the message may include a SIP message **214** and the server may include a SIP server. The SIP message **214** may include the SMS payload **216**.

The BBSC **106** decides **804** whether or not to accept the message. If the BBSC **106** determines **804** to not accept the message, the method **800** ends. If the BBSC **106** determines **804** to accept the message, an acceptance message may be sent **806** back to the server.

The BBSC **106** may create **808** a new broadcast flow. The new broadcast flow may be utilized to broadcast the SMS payload **216**. The new broadcast flow may include the BCMCS Flow ID **664** described previously. In one configuration, a channel may be allocated **810** on which the SMS payload **216** will be broadcasted. Information regarding the channel allocation and the broadcast flow may be broadcasted **812**. In one configuration, the channel and broadcast flow information may be broadcasted to a plurality of access terminals (mobile stations). The SMS payload **216** may be extracted **814** from the message and the SMS payload **216** may be encapsulated **816** into the broadcast message **668**. The broadcast message **668**, including the SMS payload **216**, may be broadcasted **818** to a destined multicast IP address on the associated broadcast flow.

FIG. **9** is a flow diagram illustrating one configuration of a method **900** of receiving the broadcast message **668** which may include the SMS payload **216**. In one configuration, an access terminal (mobile station) may implement the method **900**. The access terminal may receive **902** the broadcast overhead message (BOM) **662**. As previously explained, the BOM **662** may include channel information **666** and the BCMCS Flow ID **664**. The access terminal may retrieve **904** multicast IP address information from the BOM **662**. The multicast IP address information may include a multicast IP address associated with an SMS group users category **424**.

The access terminal may determine **906** whether or not to monitor the channel identified by the channel information **666** included in the BOM **662**. In one configuration, the access terminal may monitor the channel in order to retrieve the SMS payload **216**. The access terminal may utilize the static table **400** in order to determine **906** whether or not to monitor the channel. If the access terminal is subscribed to a group associated with the multicast IP address, the access terminal may monitor **908** the broadcast channel associated with the multicast IP address. For example, the multicast IP address may be the second address MCASTIP1 **446** from FIG. **4**. The access terminal may subscribe to the second AT group **438** which may correspond to the second address MCASTIP1 **446**. As such, the access terminal may determine **906** to monitor **908** the broadcast channel associated with the second address MCASTIP1 **446**. The access terminal may receive **910** the broadcast message **668** which may include the SMS payload **216**.

Alternatively, the access terminal may determine **906** to not monitor the broadcast channel. In one configuration, the access terminal may not subscribe to a SMS Group which corresponds to the multicast IP address included in the BOM **662**. If the access terminal determines **906** to not monitor the channel, the method **900** ends.

FIG. **10** is a thread diagram illustrating one method **1000** of sending and receiving SMS data. The SMS data may include the SMS payload **216**. The SMS-GW **1052** may receive an ANSI-41 SMDPP message **1072** from an originating SMS-GW. The originating SMS-GW is not shown for brevity. The SMDPP message **1072** may be sent over an ANSI-41 network **1004**. The SMS-GW **1052** may respond by sending an ANSI-41 SMDPP response **1074** back to the originating SMS-GW over the ANSI-41 network **1004**. In one configuration, the SMDPP message **1072** may include the SMS payload **216**.

The SMS-GW **1052** may be provisioned to use IMS. In one configuration, the SMS-GW **1052** may send the DUDR message **1056** to a home subscriber service (HSS) **1078** in order to determine whether or not the target UE is IMS registered. In the depicted thread diagram and the corresponding discussion, the target UE may be the BBSC **1006**. However, the target UE may be any other type of computing device. If the BBSC **1006** is IMS registered, the HSS **1078** may respond by sending a DUDA message **1060** to the SMW-GW **1052** indicating that the BBSC **1006** is IMS registered. The HSS **1078** may also return the address of a serving call session control function (S_CSCF) **1080** associated with the BBSC **1006**. The S-CSCF **1080** may be a SIP server and will be more fully explained below in association with FIG. **11**. In one configuration, the SMS-GW **1052**, the HSS **1078** and the S-CSCF **1080** may be included in a home network **1002**.

The SMS-GW **1052** may send a SIP message **1014** to the address of the S-CSCF **1080** associated with the BBSC **1006**. The SIP message **1014** may include the SMS payload **216**. In one configuration, a content-type value associated with the SIP message **1014** may be "application/vnd.3gpp2.sms." In a further configuration, the SMS payload **216** included in the SIP message **1014** may include a binary encoded SMS transport layer message as described in the standards document, "3GPP2 C.S0015-0 v1.0."

The S-CSCF **1080** may forward the SIP message **1014** to the BBSC **1006** via the proxy call session control function (P-CSCF) associated with the BBSC **1006**. The P-CSCF is not shown in the depicted illustration for brevity. The BBSC **1006** may respond by sending a SIP **200** OK message **1076** back to the SMS-GW **1052** via the P-CSCF (not shown) and the S-CSCF **1080** associated with the BBSC **1006**. The SIP **200** OK message **1076** may be a SIP response used by the Session Initiation Protocol to indicate a successful response by the recipient of the message. The S-CSCF **1080** may forward the SIP **200** OK message **1076** to the SMS-GW **1052**.

In one configuration, the BBSC **1006** may create a new broadcast flow which may be utilized to broadcast the SMS payload **216**. In one configuration, the new broadcast flow may be the BCMCS Flow ID **664** which may include a multicast IP address. The BBSC **1006** may also allocate a channel on which the SMS payload **216** is sent. In one aspect, an interlace-multiplex pair may denote available broadcast channels on the system. In other words, each interlace-multiplex pair may point to a separate broadcast channel. In one configuration, the BBSC **1006** allocates the interlace-multiplex pair on which the broadcast SMS payload **216** is sent. The interlace-multiplex pair and broadcast flow information may be broadcasted to the access terminals in the sector of the BBSC **1006** using a BOM **662**. In one configuration, the BOM **662** may include channel information regarding the interlace-multiplex pair and the BOM **662** may also include the broadcast flow information. The BBSC **1006** may transmit the BOM **662** to AT**1** **1008***a*, AT**2** **1008***b* and AT**3** **1008***c*.

The BBSC **1006** may also extract the SMS payload **216** from the SIP message **1014**. In one configuration, the BBSC **1006** may encapsulate the SMS payload **216** into a broadcast message (BCM) **1068**. The BBSC **1006** may send the BCM **1068** to the destined multicast IP address included in the associated broadcast flow.

The access terminals within the sector of the BBSC **1006** (AT**1** **1008***a*, AT**2** **1008***b* and AT**3** **1008***c*) that received the BOM **1068** may retrieve the multicast IP address information that may be embedded within the BCMCS Flow ID **664**. AT**1** **1008***a*, AT**2** **1008***b* and AT**3** **1008***c* may decide to monitor the associated broadcast channel (identified by the interlace-multiplex pair) if they desire to receive the BCM **1068** which may include the SMS payload **216**. AT**1** **1008***a*, AT**2** **1008***b* and AT**3** **1008***c* may utilize the static table **400** to determine which SMS Group Users they are subscribed to before determining whether or not to monitor the associated broadcast channel. The access terminals that decide to monitor the broadcast channel may receive the BCM **1068** with the included SMS payload **216**.

For example, AT**1** **1008***a* may retrieve the multicast IP address information and discover that the multicast IP address is a second address MCASTIP1 **446**. AT**1** **1008***a* may utilize the table **400** to determine that it **1008***a* is subscribed to the second AT group **438** which corresponds to the SMS Group IP address MCASTIP1 **446**. As such, AT**1** **1008***a* may monitor the associated broadcast channel in order to receive the BCM **1068** and the embedded SMS payload **216**.

FIG. **11** is a block diagram illustrating one configuration of the S-CSCF **1180**. As previously stated, the S-CSCF **1180** may be a SIP server and may facilitate receiving and transmitting SIP messages including a SMS payload **216**. In one configuration, the S-CSCF **1180** may also receive a list of pre-provisioned access terminals that may receive the SMS payload **216**.

The S-CSCF **1180** may include a message exploder **1182**. The message exploder **1182** may include a SIP message **1114**. The SIP message **1114** may include a target user list **1118**. The message exploder **1182** may explode the target user list **1118** and identifier **1184** may include the list **1118**. The list **1118** may include the SMSGroupID **422** which is associated with a set of pre-provisioned access terminals. The SMSGroupID **422** may indicate the group of access terminals that may receive the SMS payload **216**. The identifier **1184** may associate the SMSGroupID **422** with the group of access terminals and transmit the list **1118** to a mapping component **1186**. The mapping component **1186** may map the target user list **1118** to the SMS Group IP address **426** corresponding to the group of access terminals identified by the SMSGroup ID **422**.

FIG. **12** is a further configuration of a thread diagram **1200** illustrating AT**1** **1208***a* multicasting a SIP message **1214** which may include the SMS payload **216**. In one configuration, the SIP message **1214** may also include a target user list **1218** which may indicate the pre-provisioned group of access terminals the SMS payload **216** is to be sent to. AT**1** **1008***a* may multicast the SMS payload **216** to the AT group indicated by the list **1218** via the P-CSCF (not shown) and the S-CSCF **1280** associated with AT**1** **1208***a*. In one configuration, the content-type value associated with the SIP message **1214** may be "application/vnd.3gpp2.sms." The SMS payload **216** included within the SIP message **1214** may include a binary encoded SMS transport layer message as described in the 3GPP2 standards document, "3GPP2 C. S0015-0 v1.0."

In one configuration, the message exploder **1182** of the S-CSCF **1280** may explode **1290** the target user list **1218** from the SIP message **1214** in order to access the recipients of the multicast SMS payload **216**. The S-CSCF **1280** may identify the SIP message **1214** as a multicast SMS payload **216** by evaluating the target user list **1218** included within the SIP message **1214**. The S-CSCF **1280** may map the target user list **1218** to a pre-provisioned multicast IP address as explained in connection with the table **400** of FIG. **4**.

The S-CSCF **1280** may modify the original SIP message **1214** sent from AT**1** **1208***a* by removing the target user list **1218**. The S-CSCF **1280** may send the modified SIP message **1214** to the SMS-GW **1252** for delivery to the pre-provisioned multicast IP address mapped to the target user list **1218**. In one configuration, the SMS-GW **1252** may respond by sending a SIP **202** Accepted message **1288** to AT**1** **1208***a*

via the S-CSCF **1280** and the P-CSCF (not shown) associated with AT**1** **1208***a*. The SIP **202** Accepted message **1288** may be a SIP response sent by the recipient to indicate an acceptance of the message. In one configuration, the S-CSCF **1280** may forward the SIP **202** Accepted message **1288** to AT**1** **1208***a* via AT**1**'s **1208***a* P-CSCF (not shown).

The SMS-GW **1252** may send a SMDPP message **1272** to the terminating SMS-GW (not shown for brevity). The SMDPP message **1272** may be transmitted over an ANSI-41 network **1204**. The SMDPP message **1272** may include the SMS payload **216**. The terminating SMS-GW may respond to the SMDPP message **1272** by sending a SMDPP response **1274** over the ANSI-41 network **1204** to indicate to the SMS-GW **1252** that the terminating SMS-GW received the SMDPP message **1272**. In one configuration, the terminating SMS-GW may transmit the SMS payload **216** to a target UE as described in relation to FIG. **10**.

FIG. **13** illustrates various components that may be utilized in an access terminal **1308** in accordance with a configuration. The access terminal **1308** includes a processor **1302** which controls operation of the access terminal **1308**. The processor **1302** may also be referred to as a CPU. Memory **1304**, which may include both read-only memory (ROM) and random access memory (RAM), provides instructions and data to the processor **1302**. A portion of the memory **1304** may also include non-volatile random access memory (NVRAM).

The access terminal **1308** may also include a housing **1322** that contains a transmitter **1310** and a receiver **1312** to allow transmission and reception of data between the access terminal **1308** and a remote location. The transmitter **1310** and receiver **1312** may be combined into a transceiver **1320**. An antenna **1318** is attached to the housing **1322** and electrically coupled to the transceiver **1320**.

The access terminal **1308** also includes a signal detector **1306** used to detect and quantify the level of signals received by the transceiver **1320**. The signal detector **1306** detects such signals as total energy, pilot energy per pseudonoise (PN) chips, power spectral density, and other signals, as is known in the art.

A state changer **1314** of the access terminal **1308** controls the state of the access terminal **1308** based on a current state and additional signals received by the transceiver **1320** and detected by the signal detector **1306**. The access terminal **1308** is capable of operating in any one of a number of states.

The access terminal **1308** also includes a system determinator **1324** used to control the access terminal **1324** and determine which service provider system the access terminal **1308** should transfer to when it determines the current service provider system is inadequate.

The various components of the access terminal **1308** are coupled together by a bus system **1318** which may include a power bus, a control signal bus, and a status signal bus in addition to a data bus. However, for the sake of clarity, the various busses are illustrated in FIG. **13** as the bus system **1318**. The access terminal **1308** may also include a digital signal processor (DSP) **1316** for use in processing signals.

FIG. **14** is a functional block diagram illustrating a configuration of a home network component **1400**. In one configuration, the home network component **1400** may include the SMS-GW **552**, the HSS **1078** or the S-CSCF **1080**. The home network component **1400** may include a processor **1402** which controls operation of the home network component **1400**. The processor **1402** may also be referred to as a CPU. Memory **1404**, which may include both read-only memory (ROM) and random access memory (RAM), provides instructions and data to the processor **1402**. A portion of the memory **1404** may also include non-volatile random access memory (NVRAM).

The home network component **1400**, may also include a housing **1420** that contains a transmitter **1410** and a receiver **1412** to allow transmission and reception of data, such as audio communications, between the home network component **1400** and a remote location, such as a mobile station **108**. The transmitter **1410** and receiver **1412** may be combined into a transceiver **1418**. An antenna **1416** is attached to the housing **1420** and electrically coupled to the transceiver **1418**. Additional antennas (not shown) may also be used. The operation of the transmitter **1410**, receiver **1412** and antenna **1416** is well known in the art and need not be described herein.

The home network component **1400** also includes a signal detector **1406** used to detect and quantify the level of signals received by the transceiver **1406**. The signal detector **1406** detects such signals as total energy, pilot energy per pseudonoise (PN) chips, power spectral density, and other signals, as is known in the art. The signal detector **1406** may also be used to detect a SIP message **214**.

The various components of the home network component **1400** are coupled together by a bus system **1408** which may include a power bus, a control signal bus, and a status signal bus in addition to a data bus. However, for the sake of clarity, the various busses are illustrated in FIG. **14** as the bus system **1408**. The home network component **1400** may also include a digital signal processor (DSP) **1414** for use in processing signals. The home network component **1400** illustrated in FIG. **14** is a functional block diagram rather than a listing of specific components.

Information and signals may be represented using any of a variety of different technologies and techniques. For example, data, instructions, commands, information, signals, bits, symbols, and chips that may be referenced throughout the above description may be represented by voltages, currents, electromagnetic waves, magnetic fields or particles, optical fields or particles, or any combination thereof

The various illustrative logical blocks, modules, circuits, and algorithm steps described in connection with the configurations disclosed herein may be implemented as electronic hardware, computer software, or combinations of both. To clearly illustrate this interchangeability of hardware and software, various illustrative components, blocks, modules, circuits, and steps have been described above generally in terms of their functionality. Whether such functionality is implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system. Skilled artisans may implement the described functionality in varying ways for each particular application, but such implementation decisions should not be interpreted as causing a departure from the scope of the present systems and methods.

The various illustrative logical blocks, modules, and circuits described in connection with the configurations disclosed herein may be implemented or performed with a general purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array signal (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general purpose processor may be a microprocessor, but in the alternative, the processor may be any conventional processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices, e.g., a

combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration.

The steps of a method or algorithm described in connection with the configurations disclosed herein may be embodied directly in hardware, in a software module executed by a processor, or in a combination of the two. A software module may reside in RAM memory, flash memory, ROM memory, EPROM memory, EEPROM memory, registers, hard disk, a removable disk, a CD-ROM, or any other form of storage medium known in the art. A storage medium may be coupled to the processor such that the processor can read information from, and write information to, the storage medium. In the alternative, the storage medium may be integral to the processor. The processor and the storage medium may reside in an ASIC. The ASIC may reside in a user terminal. In the alternative, the processor and the storage medium may reside as discrete components in a user terminal.

The methods disclosed herein comprise one or more steps or actions for achieving the described method. The method steps and/or actions may be interchanged with one another without departing from the scope of the present systems and methods. In other words, unless a specific order of steps or actions is specified for proper operation of the configuration, the order and/or use of specific steps and/or actions may be modified without departing from the scope of the present systems and methods.

While specific configurations and applications of the present systems and methods have been illustrated and described, it is to be understood that the systems and methods are not limited to the precise configuration and components disclosed herein. Various modifications, changes, and variations which will be apparent to those skilled in the art may be made in the arrangement, operation, and details of the methods and systems disclosed herein without departing from the spirit and scope of the claimed systems and methods.

What is claimed is:

1. A method for broadcasting a short message service (SMS) payload, comprising:

receiving at a receiver, a SIP message having encapsulated therein an SMS payload and a target SMS user list, the target SMS user list indicating a group of mobile stations to which the SMS payload is to be sent, the group of mobile stations being associated with a group identifier;

exploding the target SMS user list;

consulting a static table to map the target SMS user list to a multicast IP address associated with the group identifier;

modifying the SIP message by removing the target user list;

generating a modified SIP message addressed to the multicast IP address; and

transmitting the modified SIP message to a broadcast base station controller (BBCS) for creating a new broadcast flow for broadcasting the SMS payload and allocating only a single channel for broadcasting the SMS payload to the group of mobile stations.

2. The method of claim **1**, wherein each mobile station in the group of mobile stations is pre-provisioned to the multicast IP address.

3. The method of claim **1**, wherein an ANSI-41 network sends the SMS payload to a home network.

4. The method of claim **1**, wherein the BBSC broadcasts a broadcast overhead message (BOM) comprising broadcast multicast service flow identification (BCMCS Flow ID) and channel information.

5. The method of claim **1**, further comprising verifying if the BBSC is registered on an IP Multimedia subsystem (IMS).

6. The method of claim **1**, wherein the new broadcast flow includes a BCMCS Flow ID identifying the multicast IP address associated with the group identifier.

7. The method of claim **1**, further comprising:

extracting the SMS payload from the SIP message;

encapsulating the extracted SMS payload into a broadcast message; and

broadcasting the encapsulated SMS payload to each mobile station in the group of mobile stations over the single allocated channel using the created broadcast flow.

8. The method of claim **7**, further comprising broadcasting the SMS payload to the plurality of mobile stations using code division multiple access 1× evolution data optimization (CDMA 1×EV-DO).

9. A non-transitory computer readable medium having stored thereon a set of instructions executable to:

receive a session initiation protocol (SIP) message having encapsulated therein an SMS payload and a target SMS user list, the target SMS user list indicating a group of mobile stations to which the SMS payload is to be sent, the group of mobile stations being associated with a group identifier; explode the target SMS user list;

consult a static table to map the target SMS user list to a multicast IP address associated with the group identifier;

modify the SIP message by removing the target user list;

generate a modified SIP message addressed to the multicast IP address; and

transmit the modified SIP message to a broadcast base station controller (BBSC) for creating a new broadcast flow for broadcasting the SMS payload and allocating only a single channel for broadcasting the SMS payload to the group of mobile stations.

10. The non-transitory computer readable medium of claim **9**, wherein the new broadcast flow includes a BCMCS Flow ID identifying the multicast IP address associated with the group identifier.

11. The non-transitory computer readable medium of claim **9**, wherein the instructions are further executable to:

extract the SMS payload from the SIP message;

encapsulate the extracted SMS payload into a broadcast message; and

broadcast the encapsulated SMS payload to each mobile station in the group of mobile stations over the single allocated channel using the created broadcast flow.

12. The non-transitory computer readable medium of claim **11**, wherein the instructions are further executable to use code division multiple access 1× evolution data optimization (CDMA 1×EV-DO) to broadcast the SMS payload to the plurality of mobile stations.

13. A system that is configured to broadcast a short message service (SMS) payload comprising:

means for receiving a SIP message having encapsulated therein an SMS payload and a target SMS user list indicating a group of mobile stations to which the SMS payload is to be sent, the group of mobile stations being associated with a group identifier;

means for exploding the target SMS user list;

means for consulting a static table to map the target SMS user list to a multicast IP address associated with the group identifier;

means for modifying the SIP message by removing the target user list;

means for generating a modified SIP message addressed to the multicast IP address; and

means for transmitting the modified SIP message to a broadcast base station controller (BBCS) for creating a new broadcast flow for broadcasting the SMS payload and allocating only a single channel for broadcasting the SMS payload to the group of mobile stations.

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